

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/998,683	11/30/2001	Mark J. Halstead	EMS-02302	7367

26339 7590 08/17/2004

PATENT GROUP
CHOATE, HALL & STEWART
EXCHANGE PLACE, 53 STATE STREET
BOSTON, MA 02109

EXAMINER

CHACE, CHRISTIAN

ART UNIT PAPER NUMBER

2187

DATE MAILED: 08/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/998,683	Applicant(s) HALSTEAD ET AL.	
	Examiner Christian P. Chace	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2004 and 05 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8/5/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 14 June 2004 has been entered.

Information Disclosure Statement

IDS submitted 5 August 2004 has been considered by examiner. A signed and initialed copy is attached hereto.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the newly added limitations (via amendment filed 14 June 2004) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet,

Art Unit: 2187

and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Response to Amendment

This Office action has been issued in response to Request for Continued Examination, filed 5 August 2004, and Amendment filed 14 June 2004, now entered. Further search and consideration has been given to the instant application. However, applicants' arguments, in light of the instant amendment, are not persuasive. As this is a first action on merits following an RCE, this action is NOT final.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Ofek et al (US Patent 5,889,935).

Art Unit: 2187

With respect to independent claim 1, a method of reversing a communication path between a first volume on a first storage device and a second volume on a second storage device is disclosed in figure 15 as using either of the volumes as a primary volume. Also, column 34, lines 60-64 recites reversing the roles of the R1 and R2 volumes, thereby reversing the communication path, as the host would then directly access the R2 volume and mirror to the R1 volume.

Suspending communication between the first and second volumes while maintaining operations for other volumes of the storage devices is disclosed in figure 15, #480 as suspending host processing with the R1 volume. If host processing is suspended with the R1 volume, then there is nothing to mirror to the R2 volume, so communication is inherently suspended to that volume as well. As #480 solely discloses suspension of operations for R1 and R2 (as discussed supra), it is implicitly anticipated that no other volumes are affected by the suspension.

Causing the first volume to change from a source volume to a destination volume without destroying the first volume and causing the second volume to change from a destination volume to a source volume without destroying the second volume is disclosed in figure 15 as using either of the volumes as a primary volume. Both volumes are merely synchronized, not destroyed. Also, column 34, lines 60-63 discuss the role reversal of the two volumes. The primary volume is the source volume, and the secondary volume is the destination volume, before reversal. Once reconfigured, the secondary volume is the source volume, as it would be directly accessed by the host,

Art Unit: 2187

and the primary volume is the destination volume, that would be remotely mirrored to from the source volume.

Resuming communication between the first and second volumes after causing the first volume to change from a source volume to a destination volume and causing the second volume to change from a destination volume to a source volume, prior to synchronizing the volumes, wherein, in response to a data access operation to the second volume, and valid data for the access operation existing only in the first volume, the data access operation to the second volume is satisfied by accessing data from the first volume is disclosed in column 10, lines 39-47, which discusses access commands going to the accessible device (volume) and synchronizing later when the original device becomes available again. Ofek et al literally recite, "Accordingly, each data storage device keeps data validity information about its mirrored device. If for some reason a device is not accessible, either the primary or the secondary device, every new write command goes to the accessible mirrored device along with information that the not accessible device has a track that is not valid. As soon as the non-accessible device becomes accessible, then, as a background operation, the drives re-synchronize."

With respect to claims 2, 9, and 15, causing the first volume to change from a source volume to a destination volume including modifying a table of the first storage device is disclosed in column 33, line 60 into column 34, line 17, as shown in figure 14. The table is the bitmap array, and the modification of that table occurs in steps #472 and #473.

Art Unit: 2187

With respect to claims 3, 10, and 16, causing the second volume to change from a source volume to a destination volume including modifying a table of the second storage device is disclosed in figure 14, #476 and #477. Again, the table is the other half of the bitmap array (as opposed to the first half discussed supra with respect to claims 2, 9, and 15), and the switching and copying in those steps is the modification of that table.

With respect to claims 4, 11, and 17, suspending communication including setting the first volume to a “not ready” state is disclosed in figure 15, #480 as suspending host processing to the R1 volume. If processing is suspended, then, inherently, communication is suspended, as communication is “processing” and *vice-versa*. Also, if there is no processing there is nothing to communicate.

With respect to claims 5, 12, and 18, resuming communication including setting the second volume to a “ready” state is disclosed in column 34, lines 62-63, which discloses the host directly accessing the R2 volume, which is the secondary volume.

With respect to claims 6, 13, and 19, returning a result indicating successfully reversing the communication path is disclosed in figure 15 as processing resuming using either of the volumes as a primary volume. Accordingly, if the R2 volume is, indeed, being used as the primary volume, and processing resumes, then the communication path has inherently been successfully reversed.

With respect to independent claim 7, a method of managing volumes on storage devices is disclosed in the title as remote data mirroring.

Receiving a command requesting reversal of a communication path between a first volume on a first storage device and a second volume on a second storage device is not only inherent, as a communication path is reversed, as will be discussed below, and a computer must, inherently be commanded to do something; but it is also disclosed in figure 14 as "migrate active volume."

Suspending communication between the first and second volumes while maintaining operations for other volumes of the storage devices is disclosed in figure 15, #480 as suspending host processing with the R1 volume. If host processing is suspended with the R1 volume, then there is nothing to mirror to the R2 volume, so communication is inherently suspended to that volume as well. As #480 solely discloses suspension of operations for R1 and R2 (as discussed supra), it is implicitly anticipated that no other volumes are affected by the suspension.

Causing the first volume to change from a source volume to a destination volume without destroying the first volume and causing the second volume to change from a destination volume to a source volume without destroying the second volume is disclosed in figure 15 as using either of the volumes as a primary volume. Both volumes are merely synchronized, not destroyed. Also, column 34, lines 60-63 discuss the role reversal of the two volumes. The primary volume is the source volume, and the secondary volume is the destination volume, before reversal. Once reconfigured, the secondary volume is the source volume, as it would be directly accessed by the host, and the primary volume is the destination volume, that would be remotely mirrored to from the source volume.

Resuming communication between the first and second volumes after causing the first volume to change from a source volume to a destination volume and causing the second volume to change from a destination volume to a source volume, prior to synchronizing the volumes, wherein, in response to a data access operation to the second volume, and valid data for the access operation existing only in the first volume, the data access operation to the second volume is satisfied by accessing data from the first volume is disclosed in column 10, lines 39-47, which discusses access commands going to the accessible device (volume) and synchronizing later when the original device becomes available again. Ofek et al literally recite, "Accordingly, each data storage device keeps data validity information about its mirrored device. If for some reason a device is not accessible, either the primary or the secondary device, every new write command goes to the accessible mirrored device along with information that the not accessible device has a track that is not valid. As soon as the non-accessible device becomes accessible, then, as a background operation, the drives re-synchronize."

With respect to claim 8, the command being a "single multihop, multiexecute" command that causes operations to be performed on the first and second storage devices is disclosed as "migrate active volume" in figure 14. Page 9, lines 21-23 of the instant specification were looked to in order to define this type of command, as examiner is unfamiliar with the terminology. From the instant citation, "The multihop/multiexecute system command is a single system command that is provided to multiple storage devices and indicates operations to be performed by the multiple

storage devices.” Accordingly, the “migrate active volume” command is a command in the (single) system that is provided to multiple storage devices (primary and secondary volumes) and indicates operations to be performed by the devices (migration).

With respect to independent claim 14, a computer program product is disclosed in column 33, lines 50-53 as a task using software.

Reversing a communication path between a first volume on a first storage device and a second volume on a second storage device is disclosed in figure 15 as using either of the volumes as a primary volume. Also, column 34, lines 60-64 recites reversing the roles of the R1 and R2 volumes, thereby reversing the communication path, as the host would then directly access the R2 volume and mirror to the R1 volume. This is the active migration referred to in column 33, line 50, which may be implemented in software. Software is, by definition, executable code. Examiner notes then, that the claims which depend from the instant claim are also anticipated as discussed supra by the active migration scheme being implanted by software, as discussed instantly.

Suspending communication between the first and second volumes while maintaining operations for other volumes of the storage devices is disclosed in figure 15, #480 as suspending host processing with the R1 volume. If host processing is suspended with the R1 volume, then there is nothing to mirror to the R2 volume, so communication is inherently suspended to that volume as well. As #480 solely discloses suspension of operations for R1 and R2 (as discussed supra), it is implicitly anticipated that no other volumes are affected by the suspension.

Causing the first volume to change from a source volume to a destination volume without destroying the first volume and causing the second volume to change from a destination volume to a source volume without destroying the second volume is disclosed in figure 15 as using either of the volumes as a primary volume. Both volumes are merely synchronized, not destroyed. Also, column 34, lines 60-63 discuss the role reversal of the two volumes. The primary volume is the source volume, and the secondary volume is the destination volume, before reversal. Once reconfigured, the secondary volume is the source volume, as it would be directly accessed by the host, and the primary volume is the destination volume, that would be remotely mirrored to from the source volume.

Resuming communication between the first and second volumes after causing the first volume to change from a source volume to a destination volume and causing the second volume to change from a destination volume to a source volume, prior to synchronizing the volumes, wherein, in response to a data access operation to the second volume, and valid data for the access operation existing only in the first volume, the data access operation to the second volume is satisfied by accessing data from the first volume is disclosed in column 10, lines 39-47, which discusses access commands going to the accessible device (volume) and synchronizing later when the original device becomes available again. Ofek et al literally recite, "Accordingly, each data storage device keeps data validity information about its mirrored device. If for some reason a device is not accessible, either the primary or the secondary device, every new write command goes to the accessible mirrored device along with information that

Art Unit: 2187

the not accessible device has a track that is not valid. As soon as the non-accessible device becomes accessible, then, as a background operation, the drives re-synchronize."

Response to Arguments

With respect to applicants' argument that Ofek et al do not disclose a mechanism of resuming an operation without first synchronizing the R1 and R2 volumes when they have been "swapped," examiner respectfully disagrees. Column 10, lines 39-47 clearly recite just this feature. Whether or not Ofek et al may disclose additional opportunities for synchronization is irrelevant to the instant claim language, as the instant claim language does not preclude such opportunities.

Examiner has attempted to clarify his position in the rejection discussed supra.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian P. Chace whose telephone number is 703.306.5903. The examiner can normally be reached on 9-4-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 703.308.1756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2187

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'C. P. Chace', followed by a long horizontal line.

Christian P. Chace